ELECTRICAL CHARTS.

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THE graphic method of recording symptoms in disease has many advantages. It presents to the eye at a glance a series of facts which otherwise would require tedious description. It enables a comparison to be made with ease between varying or successive conditions. It portrays the course of an affection in a way which is easily grasped, either by the student, the attending physician, or the uninstructed patient himself. The universal adoption of the use of temperature charts attests the value of the method in watching the symptom of fever in all acute affections. The sphygmographic tracing is taken in many cases of cardiac and kidney disease, and enables one to measure the varying changes in heart action or arterial tension with accuracy. Any further application, therefore, of this method hardly needs urging. It will commend itself at once.

Some years ago, Erb drew up in graphic form the changes in electrical reaction occurring in various forms of paralysis. His charts, which are reproduced in the text-books both of nervous diseases and of electro-therapeutics, are familiar to all who employ electrical measurements in diagnosis. The object of this paper is to urge the employment of these charts more widely in the general treatment of cases of paralysis, both for the purpose of simplifying and making clearer the history of such cases, and, what is of greater importance, for the purpose of determining the prognosis. It is to this latter point that attention is called.

It is always important to be able to state with approximate accuracy the duration of a disease. It is absolutely necessary to determine in a case of paralysis whether recovery is possible and how soon. In some cases, the diagnosis of the nature and seat of the lesion enables one to give the desired information. In other cases, it will not. For example, in a cerebral hemiplegia one can judge, from the severity of the onset, the extent of the paralysis, the occurrence of contractures, and the rapidity of the reaction and re-establishment of function, as to the prospect of a cure and as to the duration of the loss of power. But in cases of peripheral paralysis, this is by no means true. For example, in lead-palsy, or in multiple neuritis of alcoholic or other origin, recovery will probably occur. But some cases remain for a long time stationary; others progress rapidly; and in all, the constant question asked is: "When shall I be well?" This question cannot be answered on general principles. One patient with lead-palsy may be told that he will probably be able to work again in three months, and at the end of two years he may still be in a stationary condition. Another may be told that he cannot recover for a year, and at the end of three months he is well. This is a rather mortifying position for the physician in either case.

It is especially in this class of cases that the graphic method of electrical measurements will be found of service. It is well known that in the majority of serious cases of peripheral nerve lesion, faradic contractility is abolished, and it is only to the interrupted galvanic current that muscles contract. The intensity of the current required to cause such contraction varies greatly in different cases, and at different stages in the course of a single case. Now, if in any case measurements of that intensity are made at equal intervals for some weeks, and the successive measurements are recorded graphically and joined by a line, an "electric curve" can be produced upon the chart. Such a curve must be either: 1st, horizontal, in which case the condition in the electric reaction of the muscle is stationary; or, 2d, it will be toward the normal point, in which case the condition is improving; or, 3d, it will be away from the normal point, in which case the condition is getting worse. In the second case, in which improvement is in progress, it will not be difficult to determine quite closely the time of perfect recovery, since, after three or four measurements, the curve obtained can be projected to the normal point. It is usually the case that voluntary power is regained in a muscle some weeks before the electric reactions become normal. Hence it may be that a recovery of power can be promised quite definitely at a certain date, when the curve is obtained.

In all cases, the measurements must, of necessity, be recorded by the aid of an absolute galvanometer in milliampères; for any conclusions drawn from a comparison of the number of cells of the battery employed is fallacious, since the strength of the cells is a varying quantity. Thus in one case it was ascertained that, when the battery used was newly filled, eight cells were sufficient to obtain a reaction in one of the paralyzed muscles, while, the day before, fourteen cells had been needed to produce the same result. Actual measurement by the galvanometer, however, demonstrated the intensity of current to have been the same on both days. The chart should, therefore, be made from accurate galvanic measurements.

If the faradic current is employed, a scale should be so attached to the coil as to indicate the strength of the current. The Dubois-Reymond standard coils are not to be obtained of our electric-instrument makers, and are expensive when imported. A simple means may be employed for such measurements if the secondary coil be made to slide over the primary coil, and the distance through which it is pushed be marked in millimetres. Where the secondary coil is wholly removed from the primary, and there is no induced current, o is marked, and from this point toward the primary coil the scale is laid down.[1]

The following chart will illustrate these statements:

The vertical divisions correspond to the various dates of measurements. The horizontal divisions in the upper scale indicate milliampères, the measure of intensity of the galvanic current. The double line indicates about the normal intensity of current needed to cause a contraction, though this has been found to vary between one and three milleampères.[1] The horizontal divisions in the lower scale indicate millimetres of overlapping of the two

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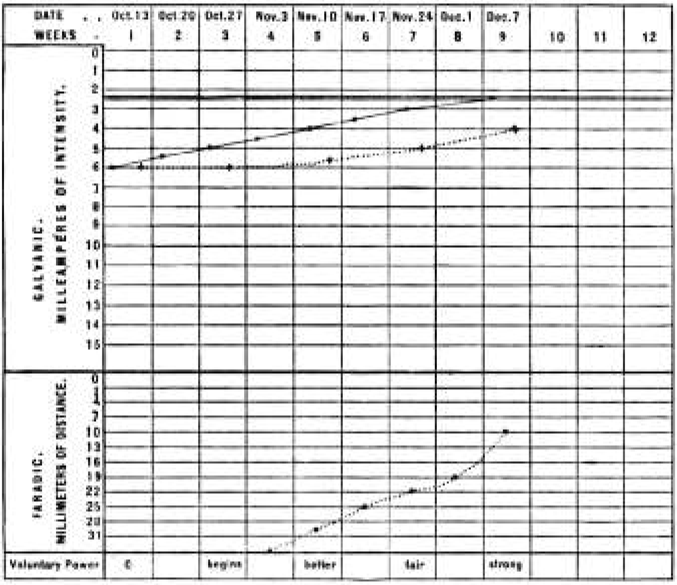
[1] Waite & Bartlett have made such a coil for me.

Electric Chart.

Name: C. E. KCC ————
Muscle: Ext. Com. Digit. Sinister. AnCC ....



faradic coils. In measuring the galvanic current, direct application of one pole to the muscle alone is considered, and not to the nerve, since it is this application which is made in treatment, and alone produces a response in severe cases of degeneration. A record of the reaction from the nerve may be added if desired. In the case which is figured on the chart (multiple neuritis), the measurements in the extensor communis digitorum sinister are given. The continuous line indicates the curve of negative closure contractions (KCC). The dotted line indicates the curve of positive closure contractions (AnCC). Both are below normal. At first both are equal, that is, KCC=AnCC, the same intensity of current producing contractions with positive and negative poles. Later, the KCC > AnCC, which is thus seen to approach normal. In the fourth week of treatment, faradic excitability returned, and gradually was produced by weaker currents. After four measurements in this case, it was possible to project the line and to state approximately the date of recovery. The case was seen many weeks after the onset of the disease, it had been stationary for some time, and a prognosis as well as a diagnosis was desired.

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[1] Möbius, " Allgemeine Diagnostik der Nervenkrankheiten," p. 144.

Those who are familiar with electrical measurements will notice that in this case there was a decrease in electric irritability, rather than the increase which sometimes occurs in degeneration. This I have found to be frequently the case in toxic paralysis. It is certainly true that the degeneration curve in lead-palsy differs widely from that in paralysis from pressure, though both are peripheral in nature. It is not at all unlikely that the use of such charts as that here presented will enable curves to be determined characteristic of various forms of degeneration. I have not used the charts long enough to establish conclusively various curves. It is partly the object of this paper to urge their immediate employment by those who are constantly applying electricity, with a view to determining such curves from a number of cases. The charts of Erb are diagrammatic, like the text-book curves of typhoid temperatures. It is not unlikely that a record of numerous cases by this method will afford interesting facts of importance, in diagnosis as well as in prognosis. Such charts have proved of great service in recording cases of fever. May they not be equally useful in cases of paralysis?